

CLAIMS

1. A cooling system for cooling a friction device, comprising:
a flow control device that controls a flow of fluid through said friction
device; and
a controller that estimates a temperature state of said friction
5 device, calculates a flow command based on said temperature state and
operates said flow control device based on said flow command.
2. The cooling system of claim 1, wherein said controller
determines a heat rate of said friction device and bases said temperature
state on said heat rate.
3. The cooling system of claim 2, wherein said controller
determines a friction device torque and a friction device slip speed and
calculates said heat rate of said friction device based on said friction device
torque and said friction device slip speed signal.
4. The cooling system of claim 2, further comprising:
a sump for collecting said flow of fluid; and
a sump temperature sensor that generates a sump temperature
signal, wherein said temperature state is further based on said sump
5 temperature signal.
5. The cooling system of claim 2, wherein said temperature state is
further based on a current flow command.

6. The cooling system of claim 1, wherein said flow command is further based on a heat rate of said friction device and a sump temperature of said flow of fluid.

7. The cooling system of claim 1, wherein said flow control device includes one of a fixed displacement pump, a variable displacement pump, an on/off valve and a variable opening valve.

8. The cooling system of claim 1, wherein said temperature state is a temperature of said friction device.

9. The cooling system of claim 1, wherein said temperature state is a thermal energy of said friction device.

10. A method of controlling cooling of a friction device, comprising:
estimating a temperature state of said friction device;
calculating a flow command based on said temperature state; and
controlling fluid flow through said friction device based on said flow
5 command.

11. The method of claim 10, further comprising calculating a heat rate of said friction device, wherein said temperature state is based on said heat rate.

12. The method of claim 11, wherein said heat rate is based on a friction device torque and a friction device slip speed.

13. The method of claim 11, further comprising measuring a temperature of said fluid flow, wherein said temperature state is further based on said temperature.

14. The method of claim 11, wherein said temperature state is further based on a current flow command.

15. The method of claim 10, wherein said flow command is further based on a heat rate of said friction device.

16. The method of claim 14, wherein said flow command is further based on a temperature of said fluid flow.

17. The method of claim 10, wherein said step of controlling fluid flow comprises operating a flow control device based on said flow command.

18. The cooling system of claim 10, wherein said temperature state is a temperature of said friction device.

19. The cooling system of claim 10, wherein said temperature state is a thermal energy of said friction device.

20. A method of controlling cooling of a friction device, comprising:
calculating a heat rate of said friction device;
estimating a temperature state of said friction device based on said
heat rate;
5 determining a flow command based on said temperature state; and
operating a flow control device based on said flow command to
control a fluid flow into said friction device.

21. The method of claim 20, further comprising:
determining a friction device torque; and
determining a friction device slip speed, wherein said heat rate is
based on said friction device torque and said friction device slip speed.

22. The method of claim 20, further comprising measuring a
temperature of said fluid flow, wherein said temperature state is further based
on said temperature.

23. The method of claim 20, wherein said temperature state is
further based on a current flow command.

24. The method of claim 20, wherein said flow command is further
based on said heat rate and a temperature of said fluid flow.

25. The method of claim 20, wherein said temperature state is a
temperature of said friction device.

26. The method of claim 20, wherein said temperature state is a thermal energy of said friction device.